REMARKS

Rejections under 35 U.S.C. §112

The rejections under 35 USC §112 are moot in light of the amendment to claim 6.

Rejections under 35 U.S.C. §103

Claims 2, 4, 6-8, 10-12, 19-24 and 26-28 stand rejected under 35 USC §103 for allegedly being obvious over Szlufcik et al. (US 2004/0063326) in view of Yamazaki (US 6,133,119) and DeJager (US 5251877). The rejection is respectfully traversed.

Submitted herewith is a certified English translation of the priority document for the instant application (i.e., DE 10241300, filed 4 September 2002). Thus, Szulfcik et al. is not prior art against the instant claims. It is respectfully requested that the rejections based on Szlufcik be withdrawn.

Claims 14 and 16 stand rejected as allegedly being obvious over Yamazaki (US 6,133,119) in view of Ichinose (US 5,688,366), Skorupski et al (US2002/0162218) and DeJager (US 5,258,777).

Claims 2-4, 6-8, 10-12, 19-24 and 26-28 stand rejected as allegedly being obvious over Skorupski et al (US2002/0162218) in view of Klien (DE10101923), Yamazaki (US 6,133,119) and DeJager (US 5,258,777).

Claim 25 stands rejected as allegedly being obvious over Skorupski et al in view of Klien, Yamazaki, DeJager and further in view of Ohlsen (US 6,641,948).

A skilled artisan looking to prepare a thickened printable etching medium, which is capable of etching very fine lines or structures on silicon surfaces, would not look to the art of resin masks and the fluid

compositions or to processes used for resin masks nor would they look to processes for general surface treatments (e.g., roughening). Furthermore, they would not look to compositions or processes for treating entirely different surfaces where inherently different surface chemistries are neccessary to etch. A skilled worker would not expect the same performance from a given etching composition on different surfaces.

Yamazaki (US 6,133,119) is concerned with increasing the roughness of a silicon surface and thus, the depth of etching is not an important consideration. A 2% NaOH aqueous solution is applied over the surface. See col. 11, lines 55-64. The medium is aqueous and not thickened. Yamazaki only discloses a method and a liquid composition for roughening a silicon surface to form uneven textures. An aim of the present invention is primarily to remove selective material from the treated silicon surface and to get even surfaces. Yamazaki discloses a treatment with 2% NaOH aqueous -but not thickened- solution at 80 °C. The etching takes place for 5 min and a roughness of about 0.1 to 5 pm is achieved (see column 11, lines 44 - 64). A skilled worker would not look toward the teaching of Yamazaki, which teaches a surface roughening composition for guidance on a composition that is capable of selectively etching fine even lines. Furthermore, Yamazaki is silent regarding an etching temperature in the range of 70 - 150 C.

A skilled worker would not look to Ichinose et al. (US 5,688,366) for guidance on etching silicon. Itchinose etches transparent conductive film (SnO_2, InO_3, ITO) with a solution that is mixed together with fine resin particles to form a paste. All examples use acidic etching compositions (concentrated sulfuric acid, concentrated hydrochloric acid or ferric chloride) and the liquids are thickened with macromolecular resin particles. Ichinose is silent regarding the etching of silicon surfaces such as those used by Yamazaki and employs an acid etchant with a completly different reactive chemistry from that of Yamazaki.

Thus, a skilled worker would not have combined the teaching of Yamazaki with Ichinose. Neither reference teaches or suggests a etching medium that is printable according to the present invention, particularly suitable for selective etching of fine lines. Nor do they teach or suggust compositions comprising a mixture of solvents (i.e., water and at least one of the different organic solvents) for achieving this purpose. Therefor, the combined teachings do not meet all of the elements of the claimed invention.

Skorupski (US 2002/0162218) teaches the manufacture of printed circuit boards having improved interlayer adhesion. Skorupski teaches a skilled worker how to generally roughen the surfaces of metal foils and not silicon surfaces. See Example 27. The Examiner relies upon Skorupski for teaching NaOH etching mediums possessing between 8 and 16%wt NaOH. Substrates are chemically etched by running them through a solution (see Example 7). The etching mediums of Skorupski roughen the substrate surfaces in order to achieve a better adhesion of interlayers. Therefor, like Yamazaki the etching mediums of Skorupski are not printable and do not provide selective etching. Like Yamazaki, Skorupski does not teach or suggest a mixture of solvents (i.e., water and at least one other organic solvent).

Even if a skilled worker were to use the NaOH etchant of Yamazaki and Skorupski in a thickened form they would still not achieve selective etching. The attached data illustrates etching pastes according to Yamazaki (8g NaOH, 92g water and 4g CMC) and Skorupski (2g NaOH, 98g water and 4g CMC), which have been thickened. As can be seen in the micrographs and profiles the thickened formulations do not achieve a good etching depth nor do they show enhanced silicon edge isolation.

Klein (DE10101923) is relied upon for teaching the addition of a thickener for making an etching solution a paste (see page 4 of English translation) . Klein does not cure the deficiences of the above discussed

references. Klein describes the etching of silicon dioxide or silicon nitride with etching compositions comprising fluoride, bifluoride or tetrafluoroborate as etchants, optionally in combination with mineral acids and/or organic acids. Klien does not teach or suggest the selective etching of silicon surfaces. A skilled worker would not look to Klien to modify the teachings of the other references because Klien discloses etching solutions for entirely different surfaces with entirely different active ingredients. These surface have active ingredients that are also different from the surfaces of the present invention.

DeJager (US 5,258,777) discloses compositions comprising isopropanol in addition to water. The present claims do not contain the solvent mixture of water and isopropanol.

Ohlsen (US 6,641,948) discloses the application of a photoresist layer to protect areas from the subsequent application of an aqueous 30 % KOH solution. Ohlsen is silent regarding a printable etching paste. As noted above, an aqueous etching solution is not comparable with the printable compositions of the present application. Ohlsen does not cure the deficiences of Skorupski or the other references. None of the references teach or suggest a printable thickened etching paste having a mixture of solvents comprising water and at least one other organic solvent. Furthermore, they are silent regarding exposure times.

Since the method of present the application is carried out using a thickened composition, the diffusion mechanism of the etchant in a thickened, thixotropic solution is entirely different from that in a liquid composition, not only are the etching results entirely different but in order to achieve good results the activating temperature has to be different as well. Furthermore, the etching process consumes significantly reduced amount of etching chemicals since the etching paste is only applied to the areas to be etched.

Thus, the combination of the references would not lead a skilled worker to the present invention. None of the cited references teach or suggest an etching medium having from 10-90 % by weight of a solvent which is a mixture of water and at least one other solvent. As stated above Applicants' have discovered that significant drawback can be avoided, if water is used as a solvent together with a further organic solvent. The combined reference teachings do not suggest the advantage or means of achieving a medium that is printable in the form of fine lines or layers.

Based on the above remarks it is respectfully requested that the rejection under 35 U.S.C. §103 be withdrawn.

No fee is believed to be due with this response, however, the Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,

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Tasks

Preparation

Pastenbeispiele

Skorupski: ÄTZ-NK-5-1
8g NaOH, + 92g DI Wasser, + 4g Finnfix (Verdicker)

Yamazaki : ÄTZ-NK-5-2
2g NaOH, + 98g DI Wasser, + 4g Finnfix (Verdicker)

Merck : SolarEtch SiD : ÄTZ-CT-05-02
Patent example

Dispensing and etching parameters

Paste: ÄTZ-CT-05-02 (Merck SID)
ÄTZ-NK-5-1 (Skorupski)
ÄTZ-Nk-5-2 (Yamazaki)

Dispensing

Printer	**GLT-Dispenser**
Layout	**Multiple lines**
Program	**43**
Needle	**PC-needle (blue), 0.016 inch-Ø**
velocity of dispense head	**100mm/s (selected conditions applied only)**
Pressure on dispense cartridge	**SolarEtch SiD, Yamazaki, Skorupski: 2,5 psi**
Needle distance	**0.5 mm**

Etching conditions

Hotplate
Temperature: 200°C, Time: 2 min

Results

- **Merck SolarEtch SID (ÄTZ-CT-05-02) etchign depth and line definition was very good (2min 200°C)**

Line width Si : 1085µm Etching Depth : 3000nm

- *Yamazaki (ÄTZ-NK-5.1) etching depth was very weak - 20nm (2min 200°C). Inhomogenous line definition*

- Skorupski (ÄTZ-NK-5.2) etching depth was weak – 300nm (2min 200°C) Inhomogenous line definition.

Conclusion / Outlook

Etching depth with Yamzaki and Skoruski formulations are too low. Formulation from Yamzaki and Skoruski are not qualified for dispensing technology.
Merck SolarEtch SiD paste shows best etching depth and application behaviour. Merck SolarEtch SiD paste is qualified for silicon edge isolation with full-automatic dispenser technology !

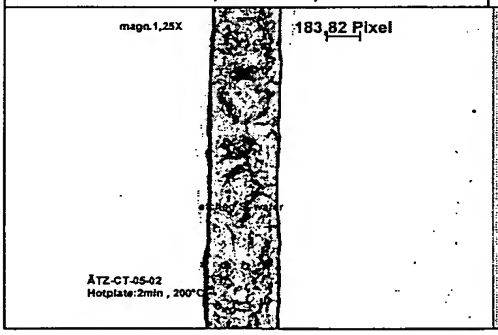
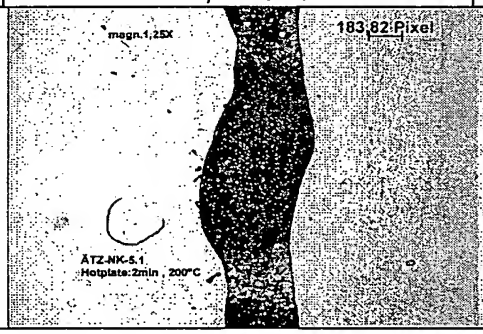
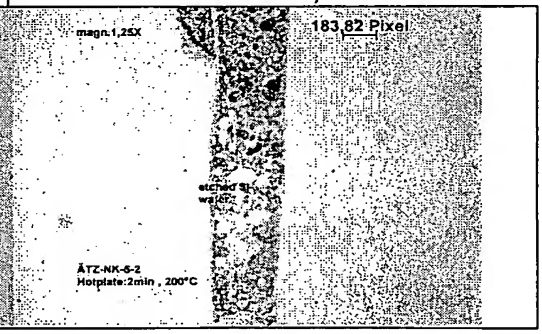
Cleaning conditions

1min with DI Water in Ultrasonic bath

Experiments/ Results

Micrographs

Axio Imager.A1 m (microscope of Carl Zeiss Jena) Magnification 1,25 x

Merck SolarEtch SID: ÄTZ-CT-05-02, 200°C, 2min	Yamazaki: ÄTZ-NK 5.1, 200°C 2min	Skorupski: ÄTZ-NK-5.2 200°C, 2min
		

Profiles

Merck SID: ÄTZ-CT-05-02	Yamazaki: ÄTZ-NK-5.1	Skorupski: ÄTZ-NK-5.2